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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/516,708

12/03/2004

Takuo Funaya

Q85154

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23373 7590 11/18/2009
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER

STONER, KILEY SHAWN

ART UNIT

PAPER NUMBER

1793

NOTIFICATION DATE

DELIVERY MODE

11/18/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

sughrue@sughrue.com
PPROCESSING@SUGHRUE.COM
USPTO@SUGHRUE.COM

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 9-13, 15-20 and 33-34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The newly added limitation "and having a melting point of 210°C or less" is not supported by the disclosure and constitutes new matter. None of the passages identified by the applicant in the response received on 9/14/09 explicitly support the endpoint of 210°C or less.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9-13, 15-20 and 33-34 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Blair et al. (U.S. 6,109,506).

When the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which anticipate or render obvious the claimed invention but has basis for shifting the burden of proof to applicant as in *In re Fitzgerald*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980). See MPEP § § 2112- 2112.02.

Blair et al. teach a solder comprising zinc at 7 to 10 weight % both inclusive, bismuth at 1 to 6 weight % both inclusive, silver at X weight % wherein X is equal to or greater than 0.025, but smaller than 0.1, and the remainder of tin, said solder being lead-free (column 2, line 61-column 3, line 10; Tables 1 and 2; and claims 7, 8, 11 and 12); said solder is in the form of powder (column 2, line 52). The composition of Blair et al. would intrinsically have the claimed composition when melted. Blair et al. also teach that the solder comprises said silver at 0.025 to .08 weight % both inclusive (column 2, line 61-column 3, line 10; Tables 1 and 2; and claims 7, 8, 11 and 12), and said solder

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contains said silver at Z weight % ($0.025 \leq Z < 0.1$) (column 2, line 61-column 3, line 10; Tables 1 and 2; and claims 7, 8, 11 and 12).

The newly added limitation “which bonds an electronic component to a circuit board by means of one or more process selected from the group consisting of a reflow process, a flow process, a soldering iron, a soldering copper, and a flip-chip process” is merely intended use of the composition and does not limit the claimed composition. Furthermore, the composition of Blair et al. is capable of being used as a solder in the claimed manner. In addition, it should be noted that the composition of Blair et al. intrinsically contains impurities. Tables 1 and 2 of Blair et al. teach that the solidus temperature is from 190 to 232°C and the liquidus temperature is from 190 to 450°C. Accordingly, it is the examiner’s position that the melting temperature of the composition of Blair et al. is 210°C or less.

With respect to claims 11-12 and 17-18, Blair et al. does not teach the diameter of the solder paste particles; however, the examiner take Official Notice that the claimed diameters are well known in the art.

With respect to claims 13, 19 and 20, Blair et al. teach that the solder is mixed with flux, but is silent with respect to the concentration of flux. It is the examiner’s position that the amount of flux is a result effective variable that would be readily optimized to obtain an adequate bond. Thus, the claimed concentration of flux would have been obvious to one of ordinary skill in the art.

Claims 9-13 and 15-36 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Shoji et al. (US 2006/0071051 A1).

When the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which anticipate or render obvious the claimed invention but has basis for shifting the burden of proof to applicant as in *In re Fitzgerald*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980). See MPEP § § 2112- 2112.02. In the instant case it is unclear if the impurity concentration of Ag described by Shoji et al. inherently meets the claim limitations.

Shoji et al. teach an electronic component soldered to a board (paragraph 3) by soldering with a Pb free solder comprising up to 9% Zn, at least 0.05% Bi (paragraphs 13-16) and a combined impurity level of Ag among other elements of less than 1% in a balance of Sn (paragraph 34). Powder diameter is 1 to 20 microns (paragraphs 42 and 43). Solder is mixed with 8-14% flux (paragraph 24). However, the particular concentration of Ag is not disclosed. Even though Shoji et al. teach that the presence of Ag under 1 mass % does not adversely affect the characteristics of the solder metal, it is the examiner's position that one of ordinary skill in the art would be motivated to reduce the level of Ag impurity in order to form a pure solder alloy. A solder alloy with a lower concentration of impurities will more readily wet the materials being bonded. In addition, a high level of impurities could alter the melting temperature of the solder alloy. Thus, it would be desirable to one of ordinary skill in the art to form a solder alloy with a

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concentration of Ag within the claimed range of 0.025 to 0.1 weight %; 0.025 to 0.08 weight %; and silver at Z weight % ($0.025 \leq Z < 0.1$).

The newly added limitation “which bonds an electronic component to a circuit board by means of one or more process selected from the group consisting of a reflow process, a flow process, a soldering iron, a soldering copper, and a flip-chip process” is merely intended use of the composition and does not limit the claimed composition. Furthermore, the composition of Shoji et al. is capable of being used as a solder in the claimed manner. Thus, the composition of Shoji et al. inevitably includes Ag and other impurities such as Pb, Sb, Cu, Fe, Al, As, Cd, etc. With respect to the newly added limitation that the melting temperature of the solder is 210°C or less, Shoji et al. teach that when the Zn content is less than 5.0 mass % the melting temperature is elevated to 215 °C or higher (paragraphs [0035]-[0036]). Thus, when the Zn content is greater than 5.0 mass % the melting temperature is lower than 215 °C. Shoji et al. teach that the Zn content is from 5.0-9.0 mass % (paragraph [0014]). Accordingly, it is the examiner's position that the teachings of Shoji et al. meet the newly added claim limitation. It should further be noted that the examiner's position is reinforced by Shoji et al. in paragraph [0100], wherein it is taught that the reflow step is carried out at a peak temperature of 220 °C, and reflow time at 200 °C or higher (50 seconds).

Response to Arguments

Applicant's arguments filed 9/14/09 have been fully considered but they are not persuasive.

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With respect to Blair et al., the applicant argues that (1) the present claims recite that the solder bonds an electronic component to a circuit board, which is not anticipated by or rendered obvious by Blair; and (2) Blair does not disclose or suggest that the melting point of the solder is 210°C or less.

The examiner respectfully disagrees. As stated above, the newly added limitation “which bonds an electronic component to a circuit board by means of one or more process selected from the group consisting of a reflow process, a flow process, a soldering iron, a soldering copper, and a flip-chip process” is merely intended use of the composition and does not limit the claimed composition. Furthermore, the composition of Blair et al. is capable of being used as a solder in the claimed manner. Tables 1 and 2 of Blair et al. teach that the solidus temperature is from 190 to 232°C and the liquidus temperature is from 190 to 450°C. Accordingly, it is the examiner’s position that the melting temperature of the composition of Blair et al. is 210°C or less. The applicant has failed to provide evidence that the compositional ranges taught by Blair et al. will not result in an alloy with a melting temperature of 210°C or less. It should also be noted that Blair et al. clearly teaches the applicant’s claimed range of Zn.

With respect to Shoji et al., the applicants respectfully submit that the present claims, which clarify that the Ag and the impurities are distinct entities, are not anticipated by or rendered obvious by Shoji.

The examiner respectfully disagrees. Paragraph [0034] of Shoji et al. states that:

Generally, the amount of each of the unavoidable impurities mingled into solder metal is 1 mass % or less. Examples of the unavoidable impurities

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include non-metallic elements, semi-metallic elements, carbon, oxygen, nitrogen and transition metals. Of these, unavoidable elements, such as Pb, Ag, Sb, Cu, Fe, Al, As, Cd, etc., are readily migrated to solder metal.

Thus, the composition of Shoji et al. inevitably includes Ag and other impurities such as Pb, Sb, Cu, Fe, Al, As, Cd, etc. It is the examiner's position that this teaching meets the newly added limitation. Furthermore, the composition of Shoji et al. intrinsically contains impurities other than Ag.

The applicant also argues that the unexpected results discussed in Mr. Funaya's Declaration (submitted on October 26, 2007) demonstrate the unexpectedly superior results of the presently claimed invention.

Regarding the unexpected results it is the examiner's position that the applicant has failed to produce evidence of unexpected results over the entire claimed range of Ag, i.e., 0.025 > 0.1. The applicant argues that the densest (eutectic) alloy can be obtained when the content of silver is 0.075 wt%; however, the claimed range is 0.025 > 0.1. Accordingly, the declaration is not entirely commensurate in scope with the claimed range. It should be noted that Reference Diagram B, which is an excerpt from the paper "Thermodynamic database for the Sn-Zn-X based lead-free solder alloy," Kodai Doi et al., Proceedings of Mate 2004, pp. 57-60 was not attached to the applicant's response. Nor was this reference previously received by the Office. In addition, Doi et al. has not been set forth on a form-1449. Accordingly, there is no further evidence of unexpected results with respect to the pending claims.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kiley Stoner whose telephone number is 571-272-1183. The examiner can normally be reached Monday-Thursday (9:30 a.m. to 8:00 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica Ward can be reached on 571-272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status

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information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kiley Stoner/

Primary Examiner, Art Unit 1793